



Status of SuperCDMS

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All Experimenters Meeting

July 21, 2014

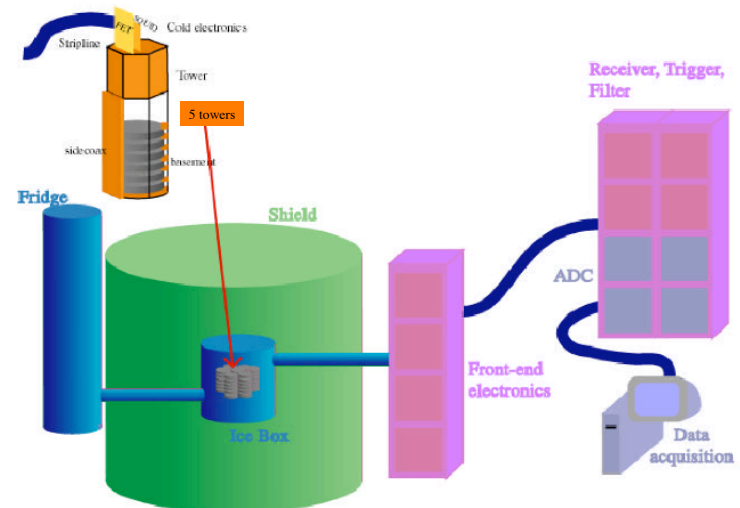
What is SuperCDMS?

Status and results of the operating Soudan experiment

Progress towards the G2 experiment at SNOLAB

Super Cryogenic Dark Matter Search - SuperCDMS

- Science: direct detection of dark matter WIMPs (and other exotic particles)
 - ‘Conventional’ WIMP candidates (e.g. SUSY)
 - ‘Dark sector’ particles (low-mass WIMPs)
 - Axions from the sun and/or the galaxy
 - Lightly-ionizing particles
- Basic experimental setup: Ge crystals with charge and phonon sensors on both sides (iZIP), operated at cryogenic temperatures, surrounded by layered shielding in a deep underground laboratory
- Collaboration: ~80 scientists from the US, Canada, France, Spain
- Funding: US (DOE, NSF) with contributions from Canada (NSERC, CFI)



Schematic of the CDMS experiment

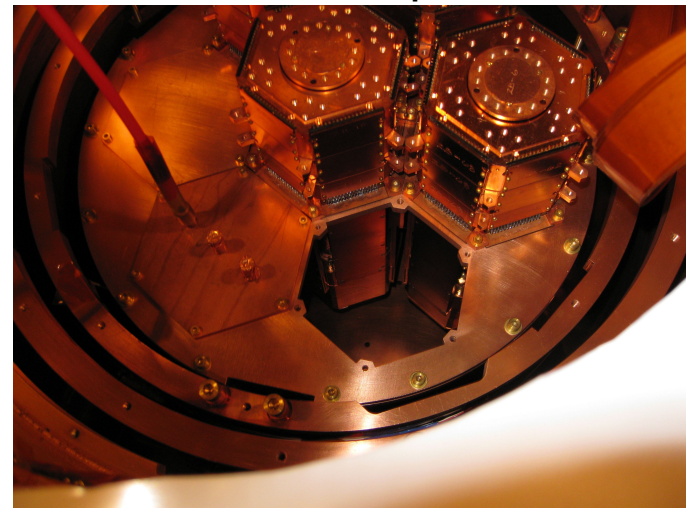
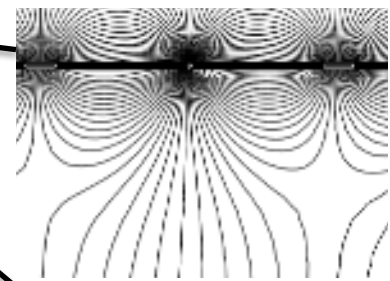
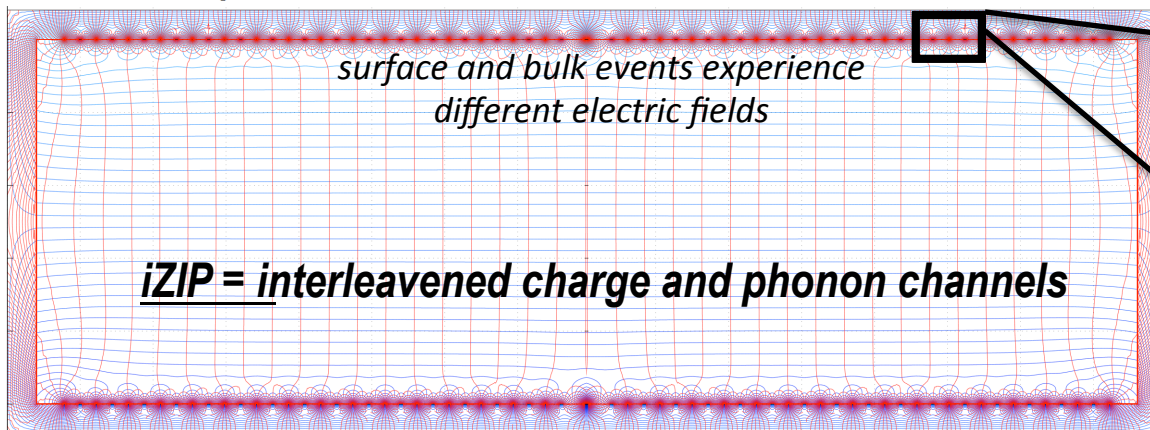
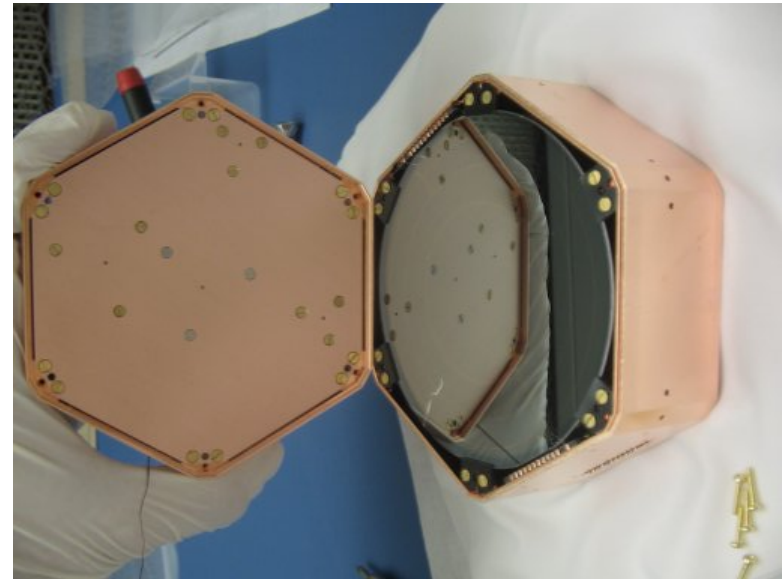
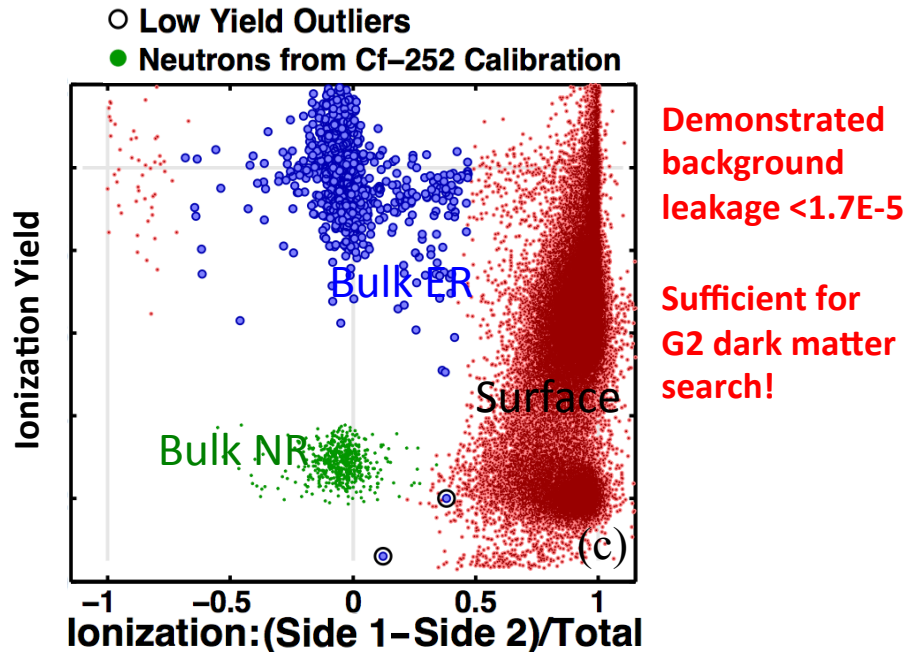


Photo showing iZIP detector towers at Soudan

SuperCDMS = iZIPs

A Detector Breakthrough Against Surface Backgrounds



Charge near surface is collected by electrodes on only one side

SuperCDMS Soudan G1 Operating Experiment

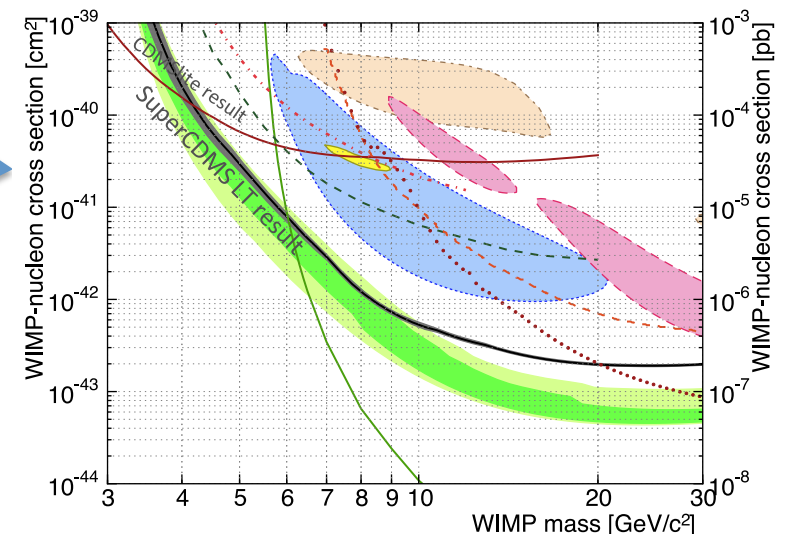
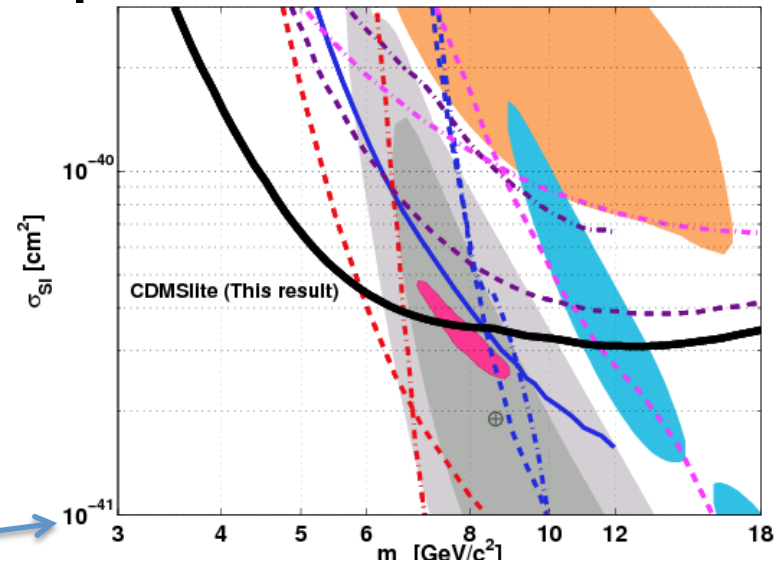
- Operations: Taking data since March 2012
- Plans: “Technical stop” for maintenance underway. Will be cold again by early September. Plan mixture of physics data and technical studies through March 2015, possibly until September 2015

- Recent Results:

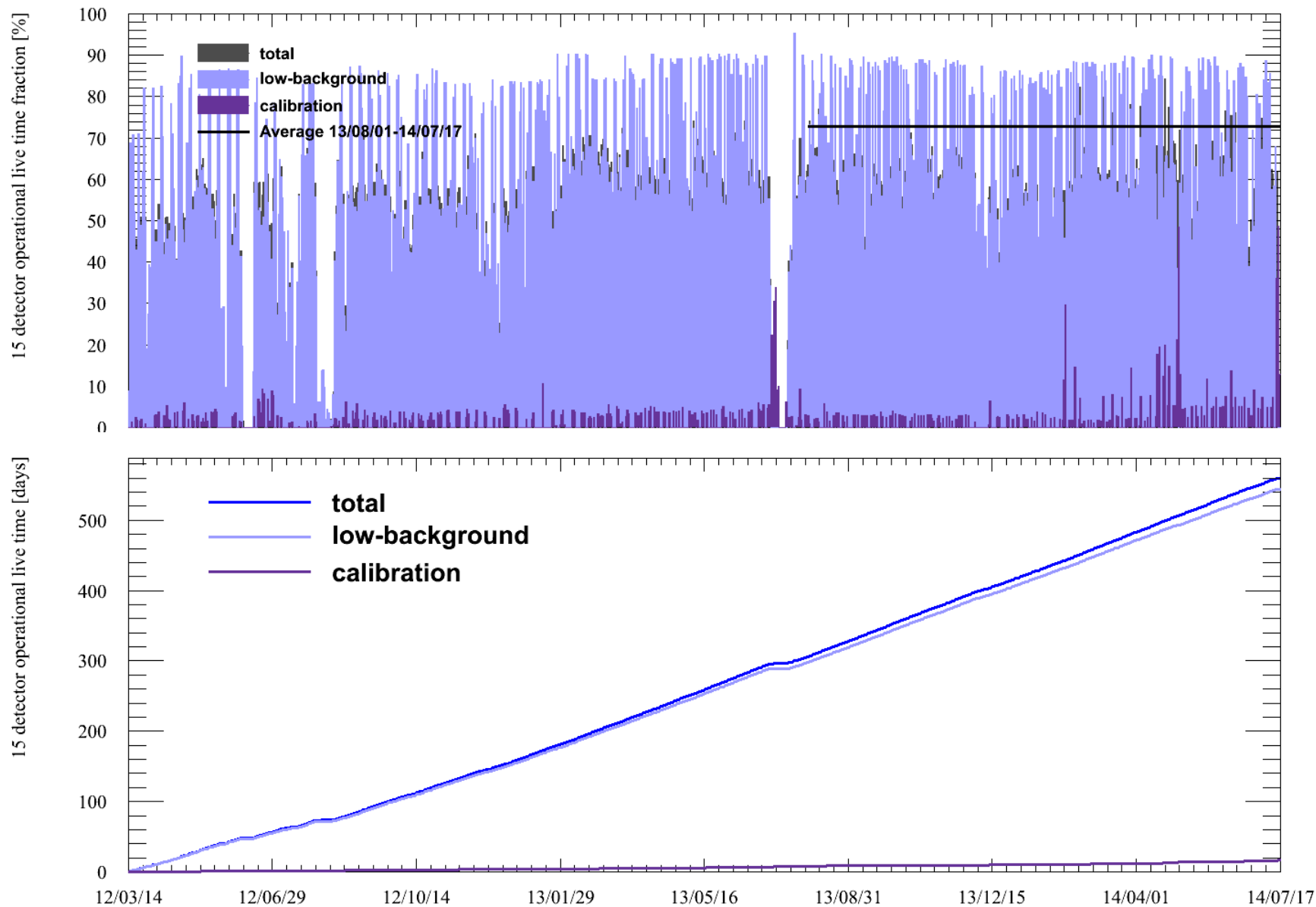
- CDMSlite
 - [arXiv:1309.3259v3](https://arxiv.org/abs/1309.3259v3); published in PRL
- SuperCDMS low threshold
 - [arXiv:1402.7137v2](https://arxiv.org/abs/1402.7137v2); published in PRL

- Upcoming Results:

- CDMSlite run 2
 - More data, background subtraction
- SuperCDMS “high threshold”
 - Background-free results from full data set



SuperCDMS Soudan Data Set



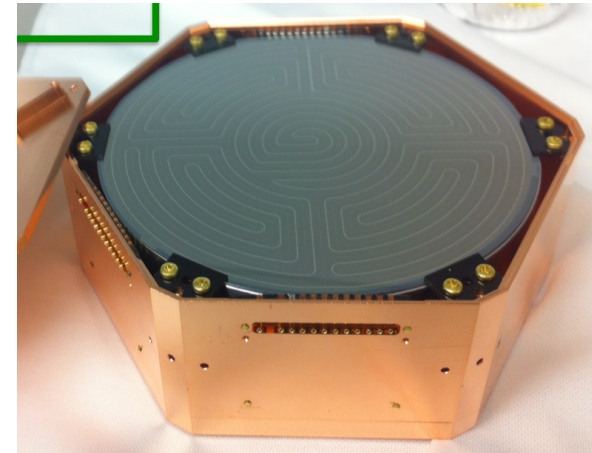
SuperCDMS Soudan Operations Plan

- Warmup for maintenance
 - Replace cold head on cryocooler
 - Service He pumps
- Studies over the next 6-12 months
 - Extended calibrations (detailed detector response)
 - Better understanding of backgrounds
 - Study electrical and vibrational noise sources and ways to reduce these
 - Determine reasons for failures of detector channels
 - See if we can run a double-sided CDMSlite detector to achieve lower backgrounds and lower energy thresholds

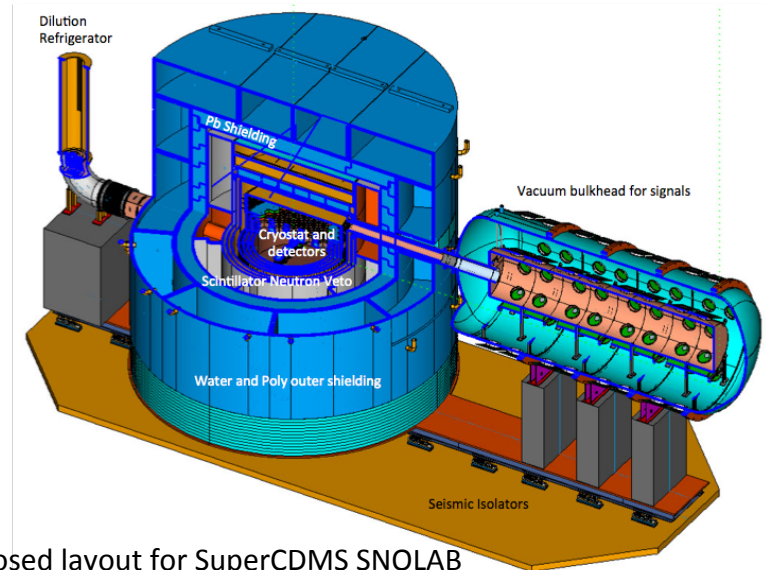
SuperCDMS SNOLAB

Recently selected as G2 experiment

- Science: direct detection of dark matter WIMPs with focus on light masses ($< 10 \text{ GeV}/c^2$)
 - ‘Conventional’ WIMPs
 - ‘Dark sector’ particles (low-mass WIMPs)
 - Other exotic particles (axions, LIPs,...)
- New experimental setup: Larger, cleaner cryogenics and shielding system, with capacity for up to 400 kg of target mass
- Location: SNOLAB, Sudbury, Ontario Canada (deepest clean laboratory in North America)
- Timescale: R&D (FY15), Fabrication (FY16-18), Operations (FY19-22)



1.3 kg Ge iZIP prototype detector



Proposed layout for SuperCDMS SNOLAB

SuperCDMS SNOLAB Reach

